

The Research Group  
**Algebra & Analysis**

has the honour to invite you to the public defence of the PhD thesis of

## **Timothy De Deyn**

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

**Categorical resolutions of filtered schemes**

Promotor:  
**Prof. dr. Michel Van den Bergh**

The defence will take place on

**Friday, October 20, 2023 at 16h in  
Auditorium D.2.01**

The defence can also be followed through a  
live stream. Send an email to  
[Timothy.De.Deyn@vub.be](mailto:Timothy.De.Deyn@vub.be) to get the link.

### **Members of the jury**

Prof. dr. Mark Sioen (VUB, chair)  
Prof. dr. Kenny De Commer (VUB, secretary)  
Prof. dr. em. Stefaan Caenepeel (VUB)  
Prof. dr. Ben Craps (VUB)  
Prof. dr. Špela Špenko (Université Libre de  
Bruxelles)  
Prof. dr. Alexander Kuznetsov (Steklov Mathematical  
Institute, Russia)  
Prof. dr. Greg Stevenson (Aarhus University,  
Denmark)

### **Curriculum vitae**

Timothy De Deyn obtained his master in Mathematics at the Vrije Universiteit Brussel in 2019. After graduating, he obtained a FWO fellowship 'aspirant fundamental research' and started his doctoral studies in the research group Algebra & Analysis.

The resulting research resulted in one publication in a peer-reviewed journal, one preprint and has been presented internationally at conferences. Additionally, during his PhD trajectory he taught exercises for several courses.

### **Abstract of the PhD research**

This thesis is situated in the branch of mathematics known as noncommutative algebraic geometry. Everyone has in their life encountered noncommutative operations, operations for which the order matters. Think for example of cooking, the notes on a piece of sheet music or simply putting on your socks and shoes.

In algebraic geometry, the focus is on studying the properties of varieties; these are geometric spaces which are given by the solutions to polynomial equations. They are governed by commutative structures. Noncommutative algebraic geometry on the other hand can be seen as both the geometric study of abstract noncommutative structures and as the application of these abstract structures to geometric spaces.

An important concept in algebraic geometry is 'resolutions of singularities'. Roughly, this is the operation of approximating badly behaved spaces by better behaved spaces. In noncommutative algebraic geometry, an analogue of this operation is given by so-called categorical resolutions of singularities. Categorical resolutions, of various kinds, are a valuable tool for better understanding the properties of varieties, shedding new light even when commutative resolutions are known to exist.

In this thesis we extend results on the existence of categorical resolutions of singularities to the setting of 'filtered schemes'. This seems to be a more natural framework for constructing these resolutions but, moreover, also allows us to weaken the assumptions needed to construct them.

This work also fits into a larger picture of trying to better understand the interplay between commutative and noncommutative geometry. As the thesis allows for a more general approach to categorical resolutions it lays important foundational work for constructing categorical resolutions of types of noncommutative varieties.